

REMARKS

Summary of the Office Action

In the Office Action dated September 25, 2002, claims 1-10 stand rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by U.S. Patent No. 5,251,055 to Koide (hereinafter "Koide").

Summary of the Response to the Office Action

Applicant has amended claim 9 to differently describe the invention. Applicant traverses the rejections of claims 1-8 under 35 U.S.C. § 102(b). Accordingly, claims 1-10 remain pending in this application.

The Rejection of Claim 1 under 35 U.S.C. § 102(b)

Claim 1 stands rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Koide. Applicant traverses this rejection of claim 1 for the following reasons.

Independent claim 1 recites a light scanning method comprising a step of "focusing the plural light beams deflected by said deflector on a surface to be scanned, with an afocal relation between the reflection surfaces of the deflector and the surface to be scanned in the direction orthogonal to the main scanning direction" (Emphasis added). Applicant respectfully submits that Koide does not teach or suggest the claimed light scanning method including at least these particular features.

In the light scanning method of the present invention, as recited in claim 1, an afocal relation is established between reflection surfaces of a deflector and a surface to be scanned. The afocal relation is generated by "an afocal optical system" which includes a first lens (which may

be a mirror with a curvature, for example) and a second lens. The first lens and the second lens are positioned respectively in such a manner with respect to each other so that a focus position of the first lens at an image forming side coincides with a focus position of the second lens at an object side. Accordingly, in the afocal optical system of the present invention, plural light beams incident onto the first lens in a mutually parallel state are also emitted from the second lens in the mutually parallel state.

In rejecting claim 1, it appears that the Examiner might be considering that the $f\theta$ lens system comprising lenses 28, 29, 30a and 30b, as depicted in Figs. 2A and 2B(1) of the Koide reference, corresponds to the afocal lens system of the present invention, because the plural parallel light beams incident thereto seem to also be emitted as plural parallel light beams. However, Applicant respectfully submits that, in Koide, two lenses 30a and 30b are positioned in a parallel manner such that respective optical axes of the lenses 30a and 30b are parallel to each other. In other words, two optical systems are provided in Koide. As recited at column 4, lines 16-19 of Koide, "Two laser beams with mutually parallel optical axes enter the lenses 28, 29 substantially perpendicularly thereto, and then enter respectively lenses 30a, 30b in the parallel state." Each of the two light beams is separately incident to one of the optical systems and emitted therefrom along the optical axis thereof. Thus, each optical system in Koide processes only one light beam.

On the contrary, in the present invention as recited in claim 1, the plural light beams propagate through a single optical system along any given portion of their path. Moreover, the plural light beams in the instant invention do not necessarily travel along the optical axis of the optical system. They are incident onto the optical system, and are emitted therefrom in a parallel manner due to the afocal characteristics of the optical system, as explained above. Accordingly,

Applicant respectfully submits that the optical system disclosed in Koide differs from the afocal optical system of the present invention for at least these reasons.

In view of the foregoing remarks, Applicant respectfully submits that Koide does not teach at least the afocal relation feature of the instant invention, in the manner recited in claim 1. Accordingly, Applicant respectfully asserts that Koide does not teach or suggest each feature of independent claim 1. As pointed out in MPEP § 2131, “[to] anticipate a claim, the reference must teach every element of the claim.” Thus, “[a] claim is anticipated only if each and every element as set forth in the claims is found, either expressly or inherently described, in a single prior art of reference. Verdegaal Bros. V. Union Oil Of California, 2 USPQ 2d 1051, 1053 (Fed. Cir. 1987).” Thus, Applicant respectfully submits that claim 1 is in condition for allowance as not being anticipated by Koide. Accordingly, Applicant respectfully requests that the rejection of claim 1 under 35 U.S.C. § 102(b) be withdrawn.

The Rejection of Claims 2-8 under 35 U.S.C. § 102(b)

Claims 2-8 stand rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Koide. Applicant traverses the rejection of these claims for the following reasons.

Independent claim 2 recites a light scanning device combination including a second optical system for focusing plural light beams “with an afocal relation between the reflection surfaces of the deflector and the surface to be scanned in the direction orthogonal to the main scanning direction.” In light of the foregoing discussion with respect to claim 1, Applicant respectfully submits that Koide does not teach or suggest the claimed light scanning device combination including at least this particular feature of claim 2 for at least the same reasons presented above with regard to claim 1.

In view of the foregoing remarks, Applicant respectfully asserts that Koide does not teach or suggest each feature of independent claim 2. Thus, Applicant respectfully submits that claim 2 is in condition for allowance as not being anticipated by Koide.

Moreover, Applicant respectfully submits that dependent claims 3-8 should be allowed at least because of their respective dependence upon allowable claim 2 and further for particular additional features that they recite.

For example, dependent claim 3 of the instant application recites the light scanning device combination of claim 2 further including the feature that “said first optical system sets an afocal and conjugate relation between said light source and the reflection surfaces of said deflector.” The Examiner asserts at page 4 of the Office Action that such a feature is shown in Fig. 6a of Koide. However, Applicant respectfully submits that, in the present invention, the above-described afocal and conjugate relation is set in a sub-scanning direction. On the contrary, Fig. 6A of Koide does not teach or even suggest such a sub-scanning direction. Moreover, even if it is assumed, strictly arguendo, that Figs. 6B(1) and 6B(2) of Koide depict the configuration in the sub-scanning direction, the optical system depicted in Fig. 6B(2) is configured as two optical systems provided in a parallel manner. Therefore, the optical system shown in Fig. 6B(2) is not afocal within the meaning of the present invention recited in the claims for at least the same reasons discussed above with regard to claim 1.

Dependent claim 4 of the present invention recites the light scanning device combination of claim 3 further including a collimator lens and a cylinder lens in an arrangement in which: “said collimator lens and cylinder lens are disposed such that a focal position at a light beam advancing direction downstream side of the collimator lens substantially coincides with a focal position at a light beam advancing direction upstream side of the cylinder lens.” In the instant

invention, as recited in claim 4, the collimator lens and the cylindrical lens are positioned such that the focal position of the collimator lens at the image forming side and the focal position of the cylindrical lens at the object side coincide with each other in a direction orthogonal to the main scanning direction (i.e., the sub-scanning direction).

Pages 4-5 of the Office Action assert that this feature of claim 4 is depicted in Fig. 6A of Koide. Applicant respectfully submits that, in order to achieve the above-described configuration as recited in claim 4, a distance between the collimator lens and the cylindrical lens must be set to be equal to a sum of a focus distance of the collimator lens and a focus distance of the cylindrical lens. However, in Fig. 6B(2) of Koide, the focus distance of the cylinder lens 4, which comprises lenses 4a and 4b, is equal to a distance to a surface of the polygon mirror (the vertical line shown at the left of cover glass 5). This is because the cylindrical lens 4 focuses the light beams collimated into parallel light beams by the collimator lens 3, which comprises lenses 3a, 3b and 3c. Moreover, the distance between the collimator lens 3 and cylindrical lens 4 of Koide is apparently shorter than that between the cylindrical mirror 3 and the surface of the polygon mirror. Accordingly, Applicant respectfully submits that the afocal relation recited in claim 4 of the present application could not be achieved with the optical system depicted in Fig. 6A of Koide.

Moreover, dependent claim 8 recites the feature that “said light source is a vertical cavity surface emitting laser diode array having plural light emission points disposed in a two-dimensional arrangement.” Page 4 of the Office Action asserts that the above feature is described in column 3, lines 58-63 of Koide. However, Applicant respectfully submits that the portion of Koide referred to by the Office Action only describes “Light beams emitted from two semiconductor laser units 21a, 21b” (Emphasis added). Applicant respectfully submits that there

is no description in Koide regarding a VCSEL (vertical cavity surface emitting laser) array having plural light emission points disposed in a two-dimensional arrangement. Moreover, Applicant respectfully submits that a person having ordinary skill in the art would interpret the term “semiconductor laser” as an edge emitting semiconductor laser, not as a VCSEL. Furthermore, Applicant submits that the “two semiconductor laser units” of Koide merely refer to lasers of two in number which does not suggest a laser in a two-dimensional arrangement as recited in at least claim 8 of the instant application. Accordingly, Applicant respectfully submits that Koide does not teach or suggest the “vertical cavity surface emitting laser diode array having plural light emission points disposed in a two-dimensional arrangement” of the present invention, as recited in claim 8.

In view of the foregoing remarks, Applicant respectfully asserts that Koide does not teach or suggest each feature of independent claim 2 as well as its dependent claims 3-8. Thus, Applicant respectfully submits that claims 2-8 are in condition for allowance as not being anticipated by Koide. Accordingly, Applicant respectfully requests that the rejections of claims 2-8 under 35 U.S.C. 102(b) be withdrawn.

The Rejection of Claims 9 and 10 under 35 U.S.C. § 102(b)

Claims 9 and 10 stand rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Koide. Applicant has amended claim 9 to differently describe the invention. To the extent that this rejection might be re-applied to this claim, as newly-amended, it is respectfully traversed as follows.

Independent claim 9, as amended, recites a light scanning device combination including at least a first cylinder optical system and the second cylinder optical system in an arrangement where:

“said first optical system sets an afocal and conjugate relation between the light source and reflection surfaces of the deflector, and said second optical system focuses the plural light beams deflected by said deflector onto the surface to be scanned while setting an afocal and conjugate relation between the reflection surfaces of the deflector and the surface to be scanned.”

Applicant respectfully submits that Koide does not teach or suggest the claimed light scanning device combination recited in independent claim 9 including at least these particular features.

In light of the foregoing discussions with respect to claims 1 and 2, Applicant respectfully submits that Koide does not teach or suggest the claimed light scanning device combination including at least the particular features of newly-amended claim 9 discussed above for at least the same reasons presented above for claims 1 and 2. Thus, Applicant respectfully submits that claim 9, as amended, is in condition for allowance as not being anticipated by Koide. Furthermore, Applicant respectfully submits that dependent claim 10 should be allowed at least because of its dependence upon allowable claim 9. Accordingly, Applicant respectfully requests that the rejection of claims 9 and 10 under 35 U.S.C. 102(b) be withdrawn.

Conclusion

In view of the foregoing, Applicant respectfully requests reconsideration and reexamination of this application, withdrawal of all rejections, and the timely allowance of all pending claims. Should the Examiner feel that there are any issues outstanding after consideration of this response, the Examiner is invited to contact Applicant's undersigned representative to expedite prosecution.

Attached hereto is a marked-up version of the changes made by the current amendment.

The attachment is captioned "**VERSION WITH MARKINGS TO SHOW CHANGES MADE.**"

If there are any other fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-0310. If a fee is required for an extension of time under 37 C.R.R. § 1.136 not accounted for above, such an extension is requested and the fee should also be charged to our Deposit Account.

Respectfully Submitted,

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Dated: March 24, 2003

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IN THE CLAIMS:

Claim 9 is amended as follows:

9. (Amended) A light scanning device comprising:

a light source;

a deflector for deflecting plural light beams emitted from said light source toward a surface to be scanned;

a first optical system including a collimator lens for making the light beams emitted from the light source as divergent luminous flux into substantially parallel luminous flux, and a cylinder lens having power for condensing in a direction orthogonal to a main scanning direction, and focusing the light beams made into substantially parallel luminous flux by the collimator lens as a line which is long in the main scanning direction on the reflection surfaces of the deflector[,]; and

a second optical system including an $f\theta$ optical system having power for condensing only in the main scanning direction, a first cylinder optical system having power for condensing in the direction orthogonal to the main scanning direction, and a second cylinder optical system having power for condensing in the direction orthogonal to the main scanning direction,

wherein said first optical system sets an afocal and conjugate relation between the light source and reflection surfaces of the deflector, and said second optical system focuses the plural light beams deflected by said deflector onto the surface to be scanned while setting [a] an afocal and conjugate relation between the reflection surfaces of the deflector and the surface to be scanned.